VIT

Vellore Institute of Technology

School of Advanced Sciences

Fall Semester 2024-2025

Continuous Assessment Test – I

Programme Name & Branch : B.Tech

Slot: E1+TE1

Course Name & code: Calculus & BMAT101L

Class Number (s): Common to all E1+TE1 slot

Exam Duration: 90 Min. **Maximum Marks: 50**

General instruction(s): Answer ALL questions, each question carries 10 marks

Q.No.	Question	Max Marks
1.	(i) Verify Rolle's theorem for the function $f(x)=x(x-3)^2$ in $[0,3]$. (ii) Verify Mean value theorem for the function $f(x)=x^3-3x+5$ in $[1,4]$.	5 5
2.	Let $f(x)=4x^3+2x^2-40x$. Find (i) the critical points (ii) the intervals on which function is increasing and on which function is decreasing. (iii) local minima and local maxima of the function f. (iv) the intervals on which f is concave up and concave down and also find the point of inflection.	10
3.	(i) Find the area of the region enclosed by the parabola $y=2-x^2$ and the line $y=-x$. (ii) Find the volume of the solid generated by revolving the region bounded by the parabola $x=y^2+1$ and the line $x=3$ about the line $x=3$.	5 5
4.	(i) Investigate the continuity of the function $f(x,y)=\begin{cases}\dfrac{x^3-y^3}{x^3+y^3}; & (x,y)\neq(0,0)\\ 0 \quad ; & (x,y)=(0,0)\end{cases}$.	5

	ii) Find $\frac{\partial z}{\partial x}+\frac{\partial z}{\partial y}$ if $z=\frac{e^{x+y}}{e^x+e^y}$	5
5.	i) Find $\frac{dz}{dx}$, if $z=x^2y$ where $x^2+xy+y^3=1$.	5
	ii) Find $\frac{du}{dt}$, if $u=xy+yz+zx$ where $x=e^t$, $y=e^{-t}$ and $z=\frac{1}{t}$.	5